UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,489	11/14/2003	Robert M. Moy	024.0181 (03-0105)	9199

55397 7590 09/19/2007

INGRASSIA FISHER & LORENZ, P.C. (BOEING)
7150 E. CAMELBACK RD.
SUITE 325
SCOTTSDALE, AZ 85251

EXAMINER	
TRINH, THANH TRUC	

ART UNIT	PAPER NUMBER
1753	

MAIL DATE	DELIVERY MODE
09/19/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/713,489	MOY, ROBERT M.	
	Examiner	Art Unit	
	Thanh-Truc Trinh	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 July 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) *30-38* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beauchamp et al. (US Patent 5449413) in view of Aiken (Photovoltaic Specialists Conference, 2000).

Regarding claim 1, Beauchamp et al. disclose a method of reducing solar absorptance of a solar panel comprising the steps of providing a coating to be adapted to be disposed about the solar cells; passing desired wavelengths of solar energy through the coating to the solar cells; reflecting undesired wavelengths of solar energy from the coating and away from the solar cells; and reflecting unused wavelengths of solar energy from the coating and away from the solar cells (See col. 3 lines 43-68 and

col. 4 lines 1-64), wherein some of the solar cell transmission band from greater than 1.1 microns through 1.2 microns can pass through the coating. (See Figure 3B).

Beauchamp et al. do not explicitly disclose triple junction solar cells.

Aiken teaches using triple junction solar cells. (See abstract of Aiken).

It would have been obvious to one having ordinary skills in the art at the time the invention was made to modify the apparatus of Beauchamp et al. by utilizing triple junction solar cells as taught by Aiken, because it would improve the overall energy conversion efficiency of the solar cell. (See the abstract of Aiken).

Regarding claims 2-5, Beauchamp et al. describe some of the wavelengths of solar energy comprises a solar cell transmission band greater than 1.1 microns through 1.2 microns (See Figure 3B). Beauchamp et al. also describe undesired wavelengths below 0.35 microns and unused wavelength above 1.2 microns are reflected. (See col. 3 lines 43-68 and col. 4 lines 1-64).

Regarding claim 6-8, Beauchamp et al. describe the solar panel has an electrical gain through lower operating temperature in a spacecraft operating in space. (See col. 1 lines 15-42 and col. 2 lines 51-61). Further, Beauchamp et al. teach using a coating to screen out ranges of wavelengths that are very close to the Applicant's claim, therefore it is obvious that the coating taught by the reference can reduce the operation temperature at least 20°C or 26°C as claimed by the Applicant.

2. Claims 9-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beauchamp et al. (US Patent 5449413) in view of Aiken (Photovoltaic Specialists Conference, 2000).

Regarding claims 9-12 and 14-15, Beauchamp et al. disclose a method of improving solar power collection in solar panels of a satellite comprising the steps of providing a near infrared wide band reflector coating before the solar cells; allowing some of solar energy wavelengths of greater than 1.1 microns to 1.2 microns through the coating to contact the solar cells; and reflecting solar energy wavelengths below 0.35 microns and above 1.2 microns from the coating and away from the solar cells. (See Figure 3A-B and col. 1 lines 15-42, col. 3 lines 42-68 and col. 4 lines 1-64).

Beauchamp et al. do not explicitly disclose triple junction solar cells.

Aiken teaches using triple junction solar cells. (See abstract of Aiken).

It would have been obvious to one having ordinary skills in the art at the time the invention was made to modify the apparatus of Beauchamp et al. by utilizing triple junction solar cells as taught by Aiken, because it would improve the overall energy conversion efficiency of the solar cell. (See the abstract of Aiken).

Regarding claim 13, Beauchamp et al. describe the solar energy wavelengths below 0.35 microns are rejected to protect an adhesive from degrading. (See col. 1 lines 56-61, col. 3 lines 42-68 and col. 4 lines 1-64)

3. Claims 16-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beauchamp et al. (US Patent 5449413) in view of Aiken (Photovoltaic Specialists Conference, 2000).

Regarding claims 16 and 19-21, Beauchamp et al. disclose a method of decreasing a solar cell's operating temperature for higher conversion efficiency comprising the steps of providing a coating on an cover-glass of a solar panel; placing at least one solar cell under the cover-glass; allowing some solar energy wavelengths of greater than 1.1 microns to 1.2 microns pass through the coating; and reflecting wavelengths below 0.35 micron and above 1.2 microns of solar energy from the coating to reduce an operation temperature. (See col. 1 lines 15-42, col. 3 lines 42-68 and col. 4 lines 1-64).

Beauchamp et al. do not explicitly disclose triple junction solar cells or the thickness of the coating in the range of 8-12 microns.

Aiken teaches using triple junction solar cells. (See abstract of Aiken).

Beauchamp et al. teach the thickness of the coating layers can be varied (See '413 col. 11 lines 13-16), the number of the coating layers can also be varied (See '413 col. 8 lines 49-51 and col. 10 lines 3-10), and different materials with different indices can be used (See '413 col. 8 lines 56-57 and col. 10 lines 10-11).

It would have been obvious to one having ordinary skills in the art at the time the invention was made to modify the apparatus of Beauchamp et al. by utilizing triple junction solar cells as taught by Aiken, because it would improve the overall energy conversion efficiency of the solar cell. (See the abstract of Aiken).

It would certainly have been obvious to one having ordinary skill in the art at the time the invention was made to increase the thickness and the number of coating layers to achieve a coating thickness of 8-12 microns, because the thicker layers insure maximum transmission of desired wavelengths (See '413 col. 11 lines 15-16), and more layers reflect a greater portion of undesired wavelengths (See '413 col. 8 lines 52-56 and col. 10 lines 6-10)

Further, Beauchamp et al. describe applying a coating on solar cell for use in space. This coating allows some solar energy wavelengths of greater 1.1 to 1.2 microns which is very close to the range of the instant claims. The Examiner believes the coating taught by Beauchamp et al. inherently reduces the operation temperature at least 20°C and gain at least 4-8% more power on a satellite.

Regarding claims 17-18, Beauchamp et al. describe that the reflecting of certain wavelengths has a minimum impact on the solar energy conversion efficiency, and maintains the cell temperature thereby maintaining thermal emittance. (See col. 3 lines 26-28).

4. Claims 22-23 and 25-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beauchamp et al. (US Patent 5449413) in view of Aiken (Photovoltaic Specialists Conference, 2000)

Regarding claims 22-23 and 25-29, Beauchamp et al. disclose a method of reflecting unused solar energy by using a NIR wideband reflector coating to reduce

overall solar energy absorptance and the cell's operating temperature resulting in an increase in power collection of a solar cell on a space craft. The method comprises the steps of providing the coating; placing at least one solar cell under the coating; allowing some solar energy wavelengths of greater than 1.1 microns through 1.2 microns to pass through the coating and reflecting wavelengths below 0.35 micron and above 1.2 or 1.3 microns of solar energy from the coating. (See Figures 3A-B, col. 1 lines 15-42, col. 3 lines 42-68 and col. 4 lines 1-64))

Beauchamp et al. do not explicitly disclose triple junction solar cells, nor do they teach using a subcell having a current density of 17mA/cm^2.

Aiken teaches using triple junction solar cells with a subcell (Ge) having current density of about 17mA/cm^2 (See abstract and tables 2-3 of Aiken).

It would have been obvious to one having ordinary skills in the art at the time the invention was made to modify the apparatus of Beauchamp et al. by utilizing triple junction solar cells as taught by Aiken, because it would improve the overall energy conversion efficiency of the solar cell. (See Abstract and Introduction of Aiken).

It would certainly have been obvious to one having ordinary skill in the art at the time the invention was made to increase the thickness and the number of coating layers to achieve a coating thickness of 8-12 microns, because the thicker layers insure maximum transmission of desired wavelengths (See '413 col. 11 lines 15-16), and more layers reflect a greater portion of undesired wavelengths (See '413 col. 8 lines 52-56 and col. 10 lines 6-10)

Further, Beauchamp et al. describe applying a coating on solar cell for use in space. This coating allows some solar energy wavelengths of greater than 1.1 through 1.2 microns, which is very close to the range of the instant claims. The Examiner believes the coating taught by Beauchamp et al. inherently reduces solar absorption up to 0.15, reduces the operation temperature at least 20°C and gains at least 1-1.4% of absolute solar cell electrical conversion efficiency.

5. Claims 22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beauchamp et al. (US Patent 5449413) in view of Nishioka et al. (Photovoltaic Specialists Conferences 2002).

Regarding claims 22 and 24, Beauchamp et al. disclose a method of reflecting unused solar energy by using a NIR wideband reflector coating to reduce overall solar energy absorptance and the cell's operating temperature resulting in an increase in power collection of a solar cell on a space craft. The method comprises the steps of providing the coating; placing at least one solar cell under the coating; allowing some solar energy wavelengths of greater than 1.1 microns through 1.2 microns to pass through the coating and reflecting wavelengths below 0.35 micron and above 1.2 or 1.3 microns of solar energy from the coating. (See Figure 3B, col. 1 lines 15-42, col. 3 lines 42-68 and col. 4 lines 1-64)

Beauchamp et al. do not explicitly disclose triple junction solar cell having a temperature conversion efficiency of –0.055%/°C (or about –0.06%/°C).

Aiken teaches using triple junction solar cell having a temperature conversion efficiency coefficient of about –0.06%/°C. (See Fig. 2 page 956 of Nishioka et al.) The temperature conversion efficiency coefficient was found by calculating the average slope of the three graphs in Fig. 2.

It would have been obvious to one having ordinary skills in the art at the time the invention was made to modify the apparatus of Beauchamp et al. by utilizing triple junction solar cell as taught by Nishioka et al, because it would improve the overall energy conversion efficiency of the solar cell. (See the Introduction of Nishioka et al.).

Further, Beauchamp et al. describe applying a coating on solar cell for use in space. This coating allows some solar energy wavelengths of greater than 1.1 microns through 1.2 microns (See Figure 3B), which is very close to the range of the instant claims. The Examiner believes the coating taught by Beauchamp et al. inherently reduces the operation temperature at least 20°C as claimed by the Applicant.

Response to Arguments

Applicant's arguments filed 7/9/2007 have been fully considered but they are not persuasive.

Applicant argues that neither Beauchamp, Aiken, Nishioka et al. nor the combination teach, suggest or motivate allowing solar energy wavelengths comprising "greater than 1.1 microns through 1.2 or 1.3 microns" to pass through the coating. The Examiner respectfully disagrees. As seen in Figures 3B, Beauchamp et al. teach a coating that can pass some wavelengths from 1.1 microns through 1.2 microns. Further,

Beauchamp et al. teach the thicker layers insure maximum transmission of desired wavelengths (See '413 col. 11 lines 13-16), and more layers reflect a great portion of undesired wavelengths (See '413 col. 8 lines 52-56 and col. 10 lines 6-10). Therefore, it would have been obvious to one skilled in the art to adjust the thickness of each coating layer or the number of coating layers to allow certain solar energy wavelengths passing through and to reject undesired or unused wavelengths.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Truc Trinh whose telephone number is 571-272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TT
09/11/2007

NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700